

## REMARKS

Initially, applicant wishes to thank the Examiner for his time in conducting the telephonic interview with applicant's attorney on September 17, 2004.

Entry of the above amendment is respectfully requested. New claims 56-58 have been added. Claims 19-27, 29, 30 and 48-58 are pending in the application. Favorable reconsideration allowance of this application is respectfully requested in light of the foregoing amendments and the remarks that follow.

### 1. Priority Claim

In the Office Action the Examiner acknowledges the priority claim based on the parent applications filed in the United Kingdom on January 25, 2000 and July 12, 2000, respectively. However, certified copies of the patent applications from which this application claims priority have not been filed as required by 35 U.S.C. Section 119(b).

With this response, applicant hereby submits certified copies of each of United Kingdom Patent Application Serial No. 0001699.8 and United Kingdom Patent Application Serial No. 0017188.4 in satisfaction of the requirement under 35 U.S.C. Section 119(b).

### 2. Rejection Under 35 U.S.C. Section 102(b)

The rejection of claims 19-24, 27, 29, 30 and 48-55 as being anticipated by Great Britain Patent No. 2,333,351 (the '351 patent) or PCT Published Application No. WO 97/21064 (the '064 application) or D. Reay, "Learning from Experiences with Compact heat Exchangers" (the Reay reference) is respectfully traversed, because, inter alia, independent claim 19, from which the remaining claims in this rejection depend, results in subject matter not discussed in any of the cited prior art references. Specifically, the Examiner correctly recognizes that the cited

references disclose various uses of a heat exchanger. However, the Examiner fails to recognize material differences between the heat exchangers shown in the prior art references cited in the claimed invention.

Specifically, claim 19 requires, inter alia, that the reactor include a reaction zone and a heat exchanger in operative contact with the reaction zone. The heat exchanger is formed from a heat exchange panel having a number of printed circuit heat exchange (PCHE) plates with fluid flow channels that are chemically or hydraulically etched, or etched by water jet in each plate to a desired depth on one or both sides of the plates. (Specification p. 8, lines 22-31; and p. 12, lines 15-23). These channels are aligned when the plates are assembled to define discrete heat exchange medium pathways, and are diffusion bonded together in this alignment. By utilizing a heat exchanger formed of the PCHE plates, close control of the reactant temperature profile through the use of heat exchanger can be achieved between the reaction zones of the reactor to optimize the reactions occurring in the adjacent reaction zones and consequently optimize the product concentrations achieved in the reactor.

In contrast, with regard to the Reay reference, the discussion in this reference regarding the PCHEs does not in any way disclose the application of heat exchangers formed of PCHE plates in operative contact with a reaction zone of a chemical reactor. The focus of the Reay reference is a discussion of the various design features and operating conditions in which it is possible to use heat exchangers formed with PCHE panels, and the only mention of any particular use of these panels is with regard to compressor after-coolers, gas coolers, gas dehydration trains, and cryogenic processes for removal of inert substances from streams. Further, Figure 8.3 of the Reay reference illustrates a PCHE heat exchanger-reactor in which

reactants introduced on one side of the exchanger-reactor are reacted and simultaneously cooled in the reactor to form the desired products. Thus, the heat exchange and reaction functions are each performed simultaneously in the heat exchanger-reactor, which greatly reduces the ability of the heat exchanger to control the temperature profile of the reactants. Therefore, the Reay reference does not disclose in any manner the use of a heat exchanger that receives reactants for heat exchange purposes formed of a PCHE panel or panels positioned in operative contact with a reaction zone that receives reactants for reaction purposes to form a reactor as required by claim 19.

Similarly, both the '351 patent and the '064 references disclose the use of heat exchanger-reactors, which each include perforations or openings that are formed in each of the plates forming the heat exchangers. The openings are present in the plates to enable the heat exchangers formed by the plates to mix the different fluids flowing through the heat exchanger. In other words, these heat exchangers function as reactors themselves, mixing the reactants charged to the heat exchanger to facilitate the reaction and simultaneously supply heat to or remove heat from the reactants. ('351 patent Abstract; and '064 application p. 17, lines 13-23). Thus, the reaction zone illustrated in both the '351 patent and the '064 application is disposed within the heat exchanger and *not* in operative contact with the heat exchanger as required by claim 19.

Further, the separation of the heat exchange and reactor functions of the heat exchangers disclosed in the '351 patent and the '064 application is not shown in either reference, because there is no disclosure in either reference of the use of these heat exchangers in conjunction with a separate reaction zone, similarly to the Reay reference. As a result, none of these references

illustrate a heat exchanger formed of PCHE plates that receive reactants for heat exchange purposes and is positioned in operative contact with a reaction zone that receives reactants for reaction purposes as required by claim 19.

Dependent claims 20-24, 27, 29, 30 and 48-56 are believed to be in condition for allowance for incorporating by reference the limitations of claim 19 and for defining additional features of the invention, which, when considered in combination with claim 19, are not anticipated by the prior art relied upon in the rejection.

In light of the forgoing, applicant respectfully requests the withdrawal of the rejections of claims 19-24, 27, 29 and 48-56.

Also, with this response applicant has added new independent claims 57 and 58 which in applicant's opinion are very similar in scope to claim 19. Specifically, claim 57 has the added limitation that the fluid flow channels in the PCHE plates do not extend completely through the plates, a limitation that is supported in the specification on p. 8, lines 22-31 and p. 12, lines 15-23, while claim 58 covers a method of creating a highly uniform temperature profile for reactants moving through a reactor having the same general structure as required by claim 19.

Therefore, for the same reasons stated previously regarding the rejection of claim 19, in applicant's opinion none of the cited references disclose a heat exchanger formed from PCHE plates that receives reactants for heat exchange purposes, the heat exchanger also being positioned in operative contact with a reaction zone of a reactor that receives reactants for reaction purposes, as required by claims 57 and 58.

3. Rejections Under 35 U.S.C. Section 103(a)

The rejection of claims 25 and 26 under 35 U.S.C. Section 103(a) as being unpatenable over the '351 patent, or the '064 application or the Reay reference is respectfully traversed, because, inter alia, there is no teaching or suggestion to combine or modify the references to produce the claim invention. Furthermore, even if the references were combined, the claimed invention would not result.

Claims 25 and 26 depend from independent claim 19 and consequently include all the limitations found in claim 19. As discussed previously, none of the '351 patent, the '064 application or the Reay reference disclose each of the elements of claim 19, specifically all of the components of the reactor including the reaction zone that receives reactants for reaction purposes and the heat exchanger formed of PCHE panels including fluid flow channels that receives reactants for heat exchange purposes. Further, even if the Reay reference and either the '351 patent or the '064 application were combined, none of these references disclose the use of a heat exchanger, formed of PCHE panels or not, that is disposed in operative contact with a reaction zone of a reactor as required by claim 19. As a result, because the '351 patent, '064 application and the Reay reference each fail to disclose or suggest the combination of each of the elements of claim 19, from which claims 25 and 26 depend, these prior art references also fail to disclose or suggest the combination of the elements of claims 25 and 26.

In light of the foregoing, withdrawal of the rejections of claims 25 and 26 is respectfully requested.

### CONCLUSION

It is submitted that claims 19-27, 29, 30 and 48-58 are in compliance with 35 U.S.C. Section 102 and 103 and each define patentable subject matter. A Notice of Allowance is therefore respectfully requested.

A check in the amount of \$128.00 (plus fee for 1 extra dependent claim) is submitted with this response to cover the required fee for a 1-month extension of time to respond to the Office Action and that fee for one claim in excess of 20 presented in the application. No other fees are believed to be payable with this communication. Nevertheless, should the Examiner consider any other fees to be payable in conjunction with this or any future communication, the Director is authorized to direct payment of such fees, or credit any overpayment to Deposit Account No. 50-1170.

In view of the forgoing remarks, the application is believed to be in prima facie condition for allowance, and such action is earnestly requested. The Examiner is invited to contact the undersigned by telephone if it would help expedite the prosecution and allowance of this application.

Respectfully submitted,



Mathew E. Corr

Registration No. 45,434

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BOYLE FREDRICKSON NEWHOLM STEIN & GRATZ, S.C.  
250 E. Wisconsin Ave., Ste. 1030  
Milwaukee, WI 53202  
Telephone: (414) 225-9755  
Facsimile: (414) 225-9753  
Customer No. 23598